AN EVIDENCE-BASED PROTOCOL FOR IMMEDIATE REHABILITATION OF THE EDENTULOUS PATIENT

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Context: A procedure using 4 dental fixtures with an immediate-loaded prosthesis for totally edentulous patients is the focus of an evidence-based analysis that uses modern methodologies to review an innovative clinical technique. The long-term outcomes for this surgical and prosthetic treatment for previously or newly edentulous patients by clinical teams worldwide, as well as the author’s clinical personal data in a referral-based private practice, are reported in this investigation.

Evidence Acquisition: An independent research dentist performed the literature review using terms that would identify articles commensurate with this article. The search years for keywords were limited to 2010 and 2011 because the purpose of the article was limited to current thinking and evidence on this specific technique. In this article, the author elected to restrict the literature search to journals that are commonly read and received in his clinical practice on a monthly basis. Because of the specific nature of this procedure, all historical references to the “all-on-4” procedure were also included in the database inquiries.

Evidence Synthesis: The literature search revealed that the investigated technique has been reported worldwide by multiple authors using retrospective clinical analyses. In the maxillary jaw, the range of implants placed was 27 to 980 fixtures with 1 to 7 years of follow-up, demonstrating a cumulative implant success rate range of 92.5% to 100%. The mandibular arch demonstrated cumulative success rates of 93.8% to 100% with 1 to 10 years of follow-up with a range of 18 to 980 fixtures being placed. The investigator’s own personal clinical statistics compared favorably with other clinical teams, with a total of 120 fixtures being placed in both jaws with 6 years of follow-up with a cumulative survival implant success rate of 100%. Continuous stability of the definitive final prosthesis was above 99% in the largest reported review and 100% for this author’s private practice.

Conclusion: Based on extensive reporting by multiple clinicians, the technique investigated is grounded in good bioengineering basic science, and demonstrates long-term clinical outcomes that can provide highly predictable long-term prosthetic stability for the edentulous patient. This highly focused critically appraised review of individual articles using 4 implants to support a fixed dental prosthesis provides clinicians and patients with a protocol that conservatively and immediately reduces the morbidity associated with the loss of teeth and removable prostheses traditional used to negate edentulism.
INTRODUCTION

Despite the acknowledged biologic phenomena of osseointegration, the field of implantology has also been presented with controversies by innovative clinicians and/or by the proposals of representative implant manufacturers. A short list of these discussions has focused on implant surface alterations, macro- and micro-geometric designs, implant body–abutment connections, and computer-enhanced implant placement. Many journal editorials, focused expert panel discussions, and entire dental conferences have been dedicated to the justification of various implant technologies.

Today’s environment for basic research is different from the past hours spent in the library developing a literature review for a master’s thesis with marking note cards, searching bookshelves, and talking to mentors. The advent of Internet searches in computer databases, international Web-based learning, and even Facebook has accelerated the access to scientific information at a pace never seen in academia and clinical practice.

Although the pace and volume of scientific information has dramatically increased, the basic procedures of scientific investigation, observation, and reporting remain the same regardless of the source of the media.

The American Dental Association has defined evidence-based dentistry as an “approach to oral health care that requires the judicious integration of systematic assessment of clinical relevant scientific evidence relating to the patient’s oral and medical condition and history, together with the dentist’s clinical expertise, and the patient’s treatment needs and preferences.” The evidence-based process has been described in the epidemiological and scientific literature.

It is the intent of this author to use the principles of scientific investigation obtained more than 30 years ago during a master’s thesis in graduate school along with the new tools of evidence-based dentistry to examine emerging changes in implant dentistry that are confounding the principles put forth by Dr. Branemark (www.nobelbiocare.com/en_us/news-events/news/2012/p-i-br-nemark-celebrates-the-dual-anniversaries-of-osseointegration-with-nobel-biocare_7.aspx) more than 60 years ago. Traditionalists have vehemently condemned these innovative procedures, whereas early adaptors, manufacturers, and some entrepreneurs have promoted this concept as a significant advancement for patients who are about to become edentulous or those who are suffering from it. A procedure using 4 dental fixtures with an immediate-loaded prosthesis for the totally edentulous patient is the targeted topic of this article (Fig. 1).

STEPS 1 AND 2. DEFINING THE PROTOCOL AND SYSTEMATICALLY SEARCHING THE LITERATURE

The clinical protocol investigated in this article was originally reported by Malo and colleagues in 2003 in a retrospective pilot study of 44 patients with 176 immediately loaded implants in the mandible using a procedure labeled the “all-on-4” technique (Fig. 2).

The following is a description commonly used for this procedure:

1. The placement of 4 dental implants in the premaxilla or anterior mandible with the 2 most distal fixtures tilted to 60 to 45 degrees and the 2 additional anterior implants that are in a vertical position that all are co-joined with a fixed screw–retained all-acrylic prosthesis preferably under immediate load. The surgical procedure for the technique can be undertaken with traditional full-thickness flaps using a malleable surgical guide (Figs. 3 and 4) or with the use of a stereo lithographic computer-aided surgical guide on a previously edentulated jaw (Fig. 5).

2. After primary stability of the dental fixtures have been verified by various subjective and objective clinical...
measurements, the multiunit transmucosal abutments are placed for a fixed screw-retained provisional prosthesis (Figs. 6 and 7).

3. The fabrication of the provisional prosthesis can occur directly in the patient’s mouth at the chair or fabricated indirectly in the dental laboratory for placement within 24 hours of the initial implant insertion.

4. Following several months of healing under controlled occlusal loads and after confirmation of osseointegration, the patient is traditionally appointed for fabrication of the definitive screw-retained fixed prosthesis, which consists of an acrylic prosthesis reinforced by a milled titanium bar fabricated during a 3- to 5-appointment prosthetic protocol (Figs. 8, 9, and 10).

The purported benefits of the protocol are reduction of the distal cantilever length, reduction in the number of implants
Branemark in his landmark article published in 1977 describing a 10-year history of treatment in totally edentulous patients. His method placed 4 to 6 implants in the mandibular infraforaminal bone or in the premaxilla anterior to the maxillary sinuses. The final bilaterally cantilevered screw-retained fixed prosthesis is placed after a 2-stage nonimmediate-loading healing schedule for at least 3 months in the mandible and at least 6 months in the maxilla. This procedure has been reported in the dental literature by multiple authors over many years as one of the most successful long-term outcomes in the history of dentistry. Dr. Branemark’s published implant survival rated at 10 years for the mandible was 88.4% with 4 implants supporting the prosthesis and 93.2% with 6 implants under the prosthesis. In the maxillary arch, he reported 78.3% with 4 implants and 80.3% with 6 implants. Subsequent articles by Adell and Branemark confirmed the success of these procedures in longer time periods.3,4 The gold standard for the successful rehabilitation for a totally edentulous patient was originally established by Professor Branemark in his landmark article published in 1977 describing a 10-year history of treatment in totally edentulous patients. His method placed 4 to 6 implants in the mandibular infraforaminal bone or in the premaxilla anterior to the maxillary sinuses. The final bilaterally cantilevered screw-retained fixed prosthesis is placed after a 2-stage nonimmediate-loading healing schedule for at least 3 months in the mandible and at least 6 months in the maxilla. This procedure has been reported in the dental literature by multiple authors over many years as one of the most successful long-term outcomes in the history of dentistry. Dr. Branemark’s published implant survival rated at 10 years for the mandible was 88.4% with 4 implants supporting the prosthesis and 93.2% with 6 implants under the prosthesis. In the maxillary arch, he reported 78.3% with 4 implants and 80.3% with 6 implants. Subsequent articles by Adell and Branemark confirmed the success of these procedures in longer time periods.3,4 Two Cochrane database...
systematic reviews have confirmed the long-term success of these procedures from multiple authors and clinicians.7,8

The Branemark approach in the anterior mandible of an edentulous patient is the measuring stick and standard by which any emerging technique must be compared in clinical practice. The appropriate use of an evidence-based approach would be a prudent methodology to evaluate any new protocols that would rehabilitate the edentulous patient with a fixed prosthesis.

A computer search was performed using the Google search engine to review the following databases provided by various organizations: EDB.ada.org from the American Dental Association, Journal of Evidence-Based Dental Practice from Elsevier/Mosby, Medline from the US National Library of Medicine, and Cochrane Library from the Cochrane Collaboration. An independent research dentist performed the literature review using the terms immediate loading, immediate function, immediate provisionalization, full arch immediate loading, all-on-four, guided surgery, and computer aided surgery in the key word searches. The search years for these keywords were limited to 2010 and 2011 because the purpose of this article was limited to current thinking on this specific technique. In this article, the author elected to restrict the literature search to the journals and evidence on this specific technique. The search was exhaustive in nature, such as one done for a systemic review paper by multiple investigators during sponsored symposia on evidence-based care for immediate-loading protocols for implant patients. The approach used in this article was proposed by Abhijit Gune in a review of evidence based dentistry in the Journal of the American College of Dentists in 2010. Dr. Gune suggested a very focused electronic search for private practitioners of no more than 30 minutes when researching a specific topic in journals that most commonly are read in the investigators area of specialization.9 The total amount of time used to search the literature in this article was 120 minutes by the independent research assistant using the parameters assigned by the author to provide a historical backdrop and current literature review of the investigated procedure.

**Conclusion**

The purpose of describing the initial methodology for this particular evidence-based inquiry is to advise the reader on how to conduct a search that would be performed by a prudent clinician busy in the daily clinical practice of dentistry. Our intent was not to do an extensive search that would be exhaustive in nature, such as one done for a systemic review paper by multiple investigators during sponsored symposia on evidence-based care for immediate-loading protocols for implant patients. The approach used in this article was proposed by Abhijit Gune in a review of evidence based dentistry in the Journal of the American College of Dentists in 2010. Dr. Gune suggested a very focused electronic search for private practitioners of no more than 30 minutes when researching a specific topic in journals that most commonly are read in the investigators area of specialization.9 The total amount of time used to search the literature in this article was 120 minutes by the independent research assistant using the parameters assigned by the author to provide a historical backdrop and current literature review of the investigated procedure.

**STEP 3: APPRAISE THE VALIDITY AND RELIABILITY OF THE EVIDENCE**

The most significant article identified in the literature search was published by the clinician who is identified as the early reporter on the clinical success of the procedure. Malo et al10 reported in *The Journal of The American Dental Association* in 2011. They reported on 245 patients receiving a total of 980 dental implants with patient-related success rates of 93.8% and implant-related success rates of 94.8% at 10 years. The survival rate of their prostheses in the mandible was 99.2% at 10 years of follow-up.

These results are significant and highly comparable in its reported successes to the landmark paper of Branemark et al in 1977.11 The original Branemark patient population validated the reliability of osseointegration on 6 implants for the rehabilitation of the edentulous patient on a fixed prosthesis, thereby establishing the gold standard at that time. Dr Branemark also reported on the use of 4 fixtures for the prosthetic reconstruction of an edentulous patient.11

**TABLE 1. Maxillary studies of cumulative implant survival of investigated protocol**

<table>
<thead>
<tr>
<th>Author</th>
<th>No. of tilted implants</th>
<th>Follow-up</th>
<th>Cumulative survival, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krekmanov et al 200212</td>
<td>40</td>
<td>5 y</td>
<td>95.7</td>
</tr>
<tr>
<td>Aparicio et al 200113</td>
<td>42</td>
<td>7 y</td>
<td>95.2</td>
</tr>
<tr>
<td>Fortin et al 200214</td>
<td>90</td>
<td>5 y</td>
<td>92.2</td>
</tr>
<tr>
<td>Calandrillo and Tomatis 200515</td>
<td>27</td>
<td>3 y</td>
<td>96.3</td>
</tr>
<tr>
<td>Capelli et al 200716</td>
<td>82</td>
<td>Up to 40 mo</td>
<td>97.59</td>
</tr>
<tr>
<td>Testori et al 200817</td>
<td>82</td>
<td>Up to 36 mo</td>
<td>97.1</td>
</tr>
<tr>
<td>Agliardi et al 200918</td>
<td>84</td>
<td>Up to 36 mo</td>
<td>100</td>
</tr>
<tr>
<td>Hinze et al 201019</td>
<td>38</td>
<td>1 y</td>
<td>94.6</td>
</tr>
<tr>
<td>Babbash et al 201120</td>
<td>272</td>
<td>Up to 18 mo</td>
<td>99.5</td>
</tr>
</tbody>
</table>
The nature of this investigation on the effect of a specific therapeutic modality on real patients constitutes a large volume of the evidence-based literature. In this specific article, the use of 4 implants in the maxilla and mandible to support an immediately loaded fixed full-arch all-acrylic prosthesis is being considered to determine if successful outcomes of this procedure measure favorably with long-established treatment protocols using time-tested 2-stage healing protocols and delayed loading of the definitive prosthesis.

In addition to the clinical studies, research elicited several recent articles using the finite element method of computer modeling to perform structural mathematical analysis of a bar supported by 4 structures simulating dental implants. Within the acknowledged limitations of these finite element methods in human living structures, it appears that several biomechanical principles of a curve beam under various loading parameters can be established and possibly transferred to the clinical environment.

TABLE 2. Mandibular studies of cumulative implant survival rate of investigated protocol

<table>
<thead>
<tr>
<th>Author</th>
<th>No. of tilted implants</th>
<th>Follow-up</th>
<th>Cumulative survival rate, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krekmanov et al 2000</td>
<td>36</td>
<td>5 y</td>
<td>100</td>
</tr>
<tr>
<td>Malo et al 2003</td>
<td>88</td>
<td>3 y</td>
<td>98.9</td>
</tr>
<tr>
<td>Malo et al 2006</td>
<td>18</td>
<td>1 y</td>
<td>98.9</td>
</tr>
<tr>
<td>Capelli et al 2007</td>
<td>48</td>
<td>Up to 52mo</td>
<td>97.59</td>
</tr>
<tr>
<td>Francetti et al 2008</td>
<td>124</td>
<td>Up to 48mo</td>
<td>100</td>
</tr>
<tr>
<td>Malo et al 2011</td>
<td>980</td>
<td>10 y</td>
<td>93.8</td>
</tr>
<tr>
<td>Babush et al 2010</td>
<td>436</td>
<td>Up to 18mo</td>
<td>100</td>
</tr>
</tbody>
</table>

Tables 1 and 2 report the findings of this our literature search broken down by success rate in the maxilla and mandible respectively.

Additionally, 3 articles have been published on the bioengineering of the protocol using finite element modeling. These experimental computer model studies by Silva et al in 2010, Fazi et al in 2011, and Kim et al 2011 demonstrated some theoretical concepts that may be important relative to the investigated protocol.

The following principles and guidelines were suggested from these articles:

1. Titling of the distal implants does reduce the anteroposterior spread and therefore minimizes the cantilever lengths in investigated protocol.
2. Reducing the cantilever length in the investigated protocol is biomechanically sound and should be considered as the goal for all fixed implant prosthodontic appliances that are cantilevered distally.
3. Finite element modeling stress patterns were similar in all-on-4 and all-on-6 models.
4. Appropriately designed rigid prosthetic structures are needed to reduce the load of force vectors on the bone, abutments, screws, and biomaterials used in the fixed dental prosthesis.

Conclusion

Based on volume of clinical data available on the investigated technique, it would appear that sufficient references by multiple authors were found in the search engines by the independent investigator. Most of the articles reporting on the clinical outcomes were published as case series retrospective cohort studies. Parel and Phillips reported in a preliminary study in 2010 a large number of implants, 2132, placed in the maxilla and mandible in an “all-on-four” configurations. They cumulative success rate was 96.53% in the maxilla and 99.30% in the mandible for the all-on-four approach from 2008 to 2010.

The nature of this investigation on the effect of a specific therapeutic modality on real patients constitutes a large volume of the evidence-based literature. In this specific article, the use of 4 implants in the maxilla and mandible to support an immediately loaded fixed full-arch all-acrylic prosthesis is being considered to determine if successful outcomes of this procedure measure favorably with long-established treatment protocols using time-tested 2-stage healing protocols and delayed loading of the definitive prosthesis.

In addition to the clinical studies, research elicited several recent articles using the finite element method of computer modeling to perform structural mathematical analysis of a bar supported by 4 structures simulating dental implants. Within the acknowledged limitations of these finite element methods in human living structures, it appears that several biomechanical principles of a curve beam under various loading parameters can be established and possibly transferred to the clinical environment.

STEP 4. USING EVIDENCE IN TREATMENT PLANNING FOR THERAPEUTIC RECOMMENDATIONS TO PATIENTS.

Since 2005, this author has used the technique of a computer-aided surgical approach using a stereolithographic guide or a malleable surgical device placed during a flap procedure in the maxilla and/or mandible. The clinician conducting this study also used additional methodologies to treat edentulous patients based on the objective and subjective clinical analysis of the patient. Table 3 documents our clinical experiences since 2005 in treating edentulous patients.

Conclusion

Treatment planning for the edentulous patient should be a systematic analysis of the availability of bone, force factors present within the patient’s envelop of function, radiographic analyses, mandibular and maxillary bone physiology and anatomy, biomaterials, facial esthetics, treatment economics, and, most importantly, the patient’s needs and desires. Recommended treatment alternatives presented to our patients are based on these evaluations, informed consents, and based on the ethical principle of self-determination.
provided successful outcomes that match Malo’s 10 year with a cumulative on 4 implants and Branemark’s gold standards for cumulative implant survival on 5 implants. However, the ultimate clinical outcome for the patient is the continuous lifetime survivability of the prosthesis regardless of the number of implants under the fixed prosthesis. Branemark et al11 in 1985 also reported these data on the placement of 4 fixtures in the maxilla and mandible when local anatomy did not allow for placement of 6 fixtures. The 4 fixtures were restored with a fixed prosthesis following confirmation of osseointegration using a 2-stage healing protocol. Branemark et al10 went on to state that the results were almost identical to 6-fixure prosthesis results with regard to continuous bridge stability when observed over 5 to 12 years. Table 4 reviews the continuous bridge stability from the 2 aforementioned studies identified in the literature review as well as the author’s own clinical data.

From these data, it would appear that placing a fixed dental prosthesis with a substructure of titanium veneered in acrylic with bilaterally cantilevered distal extensions on 4 dental implants can provide the patient with predictable function and acceptable esthetics for long periods of time. The success of the prosthetic outcome can be achieved using a traditional 2-stage protocol for osseointegration or a single-stage immediate-loading protocol in the mandible and/or maxilla.

<table>
<thead>
<tr>
<th>Arch</th>
<th>No. of implants immediately loaded</th>
<th>Case style</th>
<th>Cumulative survival rate, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxilla</td>
<td>157</td>
<td>Misch-6-8 NobelGuided</td>
<td>98.10</td>
</tr>
<tr>
<td>Maxilla</td>
<td>80</td>
<td>Malo All-On-4 NobelGuided</td>
<td>100.00</td>
</tr>
<tr>
<td>Maxilla</td>
<td>17</td>
<td>Balshi Max Guides/Zygomas</td>
<td>100.00</td>
</tr>
<tr>
<td>Mandible</td>
<td>210</td>
<td>Branemark-Traditional</td>
<td>99.00</td>
</tr>
<tr>
<td>Mandible</td>
<td>40</td>
<td>Malo All-On-4 Traditional</td>
<td>100.00</td>
</tr>
<tr>
<td>Totals</td>
<td>493</td>
<td>Multistyles</td>
<td>99.42</td>
</tr>
</tbody>
</table>

**TABLE 3. Reported implant cumulative survey rate using various treatment protocols in the maxilla and mandible**

**STEP 5. ASSESSING TREATMENT OUTCOME AS EXPERIENCE BY THE PATIENT**

The final step of this article explores the most commonly overlooked arena of evidence-based medicine and dentistry: how did the clinical encounter lead to improve health and quality of life for the patient? This is a question that truly can be answered only by the patient who experiences the recommended treatment protocol. Unfortunately, the meaning of the concept of “quality of life” is constantly debated by biopsychological, epidemiological, and behavioral scientists with little or no consensus agreement on its applicability to the individual patient. Studies of the impact of dental implants on quality of life in a strict science sense can be weak but at the same time anyone who has treated this subset of dental patients for a long time knows the clinical outcome of thousands of patients worldwide expose the benefits of osseointegration and a fixed dental prosthesis are life-changing events for patients.

MacEntee stated in 200625 that “when the subjects finally treated with fixed prosthesis ad modum Branemark novum, they felt that they had become the person they once were.” They felt social security in interactions with others and also regained attraction as a result of their fixed prosthesis. For many years the informants described how they experienced good dental status, which did not cause them either pain or embarrassment. Patients also had feelings of gratitude for the

**TABLE 4. Continuous prosthesis stability comparisons of treatment on 4 fixtures**

<table>
<thead>
<tr>
<th>Investigator</th>
<th>Observation period, y</th>
<th>No. of maxillary jaws</th>
<th>No. of mandibular jaws</th>
<th>Continuous stability, maxillary</th>
<th>Continuous stability, mandibular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branemark et al 198511</td>
<td>5-12</td>
<td>13</td>
<td>13</td>
<td>95.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Malo et al 201110</td>
<td>10</td>
<td>NA</td>
<td>245</td>
<td>NA</td>
<td>99.4%</td>
</tr>
<tr>
<td>Duello 2012</td>
<td>6</td>
<td>27</td>
<td>15</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>278</td>
<td>97.5%</td>
<td>99.8%</td>
</tr>
</tbody>
</table>
technique that made it possible for them to go through with treatment for fixed prosthesis.

Since 1986, this author has personally experienced these clinical commentaries and feelings exposed by many outpatients receiving fixed implant prosthesis. We did not document them in any formal tool used to subjectively record or objectively measure the quality-of-life change in the patient relative to the clinical encounter. In an attempt to document the patient experience with all protocols for totally edentulous patients without financial inducements, without violation of a code of ethics, and in respect for individual privacy, this author has videotaped documentation of the subjective experience of multiple patients receiving care for total edentulism. Most patients were asked a series of 5 questions by their encounters in our office that led to the successful placement of a fixed prosthesis:

1. What challenges has this treatment overcome for you?
2. How was your experience?
3. What do you not have to put up with anymore?
4. What surprised you about this experience?
5. What would you tell others about your experience?

These posttreatment interviews that document long- and short-term patients are posted on www.youtube/geroge-duello.com. These interviews of patients who are suffering and have successfully been treated for total edentulism are dramatic and traumatic.

Conclusion

From the patient’s perspective, the quicker a disability can be resolved and health can be restored with reasonable predictability, the better the likelihood the patient will consent to the recommended procedure. Based on multiple successful patient treatments using various modalities of treatment and numerous patient exit interviews, it has been the author’s experience that when patients are faced with the option of 1 surgery and a prosthetic procedure in 1 setting for immediate loading versus multiple procedures over a prolonged time frame for resolution of the disability of total edentulism, the patient will select the least invasive and most expedient protocol that meets their needs and eliminates the challenges that total edentulism can present to patients.

The greatest deterrent to resolving the disability of edentulism in an expeditious manner is not convincing the patient of the likelihood of a successful outcome. It is educating and convincing the dental profession at large that total edentulism is a serious health disability that can be mitigated with treatment algorithms that prolong the disability to the patient. Critics sometimes lament that they cannot understand why patients and dentists would be in a hurry to treat the patient in an expedited manner when older slower protocols work and have been tested over time. Those who have these traditionalist opinions, which this author also had for some time, need to “walk a mile” in the patient’s shoes before they rush to judgment on the need to reduce the sequence of treatments for edentulism.

DISCUSSION

The scientific and biological foundation for this protocol is osseointegration, not the geometry of the fixture placement. Titanium fixtures can be placed vertically, tilted to various angles for dental prostheses, inserted horizontally in maxillofacial reconstructions to retain facial prosthesis fabricated by anaplastologists, or surgically implanted at multiple angles in linear incisions for bone-anchored hearing aids. It is the functionality and benefit to the patient who receives these devices that is the most important leg of evidence-based dentistry, not the axial placement and final orientation of the osseointegrated fixture. For more than 50 years, the dental literature has listed multiple protocols for the successful dental rehabilitation of the edentulous patient using various configurations for implant placement and prosthetic design.

The technique proposed by Malo et al in 2003 and followed with the article by Malo et al in 2011, meets gold standards set by Professor Branemark based on the use of a 5-step evidence-based analysis demonstrated in the article. The protocol investigated in this article defines the lower limits of the number of implant fixtures required to successfully support a fixed implant prosthesis in the mandible or maxilla.

Eldrege and Gould in 1985 stated that biologic evolution is not a steady and gradual process. These authors pointed out that there are years of stability that are then interrupted by episodes of rapid innovation. Dentistry and dental procedures may follow the same stable practice patterns with practitioners making no or minor changes to procedures over prolonged periods. Then a so-called “tipping point” in research or clinical innovations exerts forces on the entire practice, which then forces the clinician to evaluate whether it is worthwhile to change habits based on new information. David Chambers in 2010 stated in a review of evidence-based dentistry that “only the integration in a unique practice setting of the relevant clinical epidemiology literature, professional judgment from patients’ circumstances and value counts as evidence-based dentistry.” The protocol investigated in this article defines the lower limits of the number of implant fixtures required to successfully support a fixed implant prosthesis in the mandible or maxilla.

In his remarks for the First P-I Branemark Scientific Symposium in Gothenberg in 2009, Dr Branemark discussed the limits of what one can do with very sophisticated methods. Branemark closed with a statement suggesting simplified...
approaches to patient treatment by stating, “I hope you try to simplify procedures and make them more reliable.” Dr. Branemark has always advocated the notion that less is more. He has stated that this was his ambition when it comes to dimensions and numbers of anchoring elements. But those precepts accepts the notion that the functional loads on the prosthesis do not allow undue stresses and strains to damage and destroy the bone tissue that is vital in providing function to the patient.

The biologic healing phenomena of osseointegration is not determined by whether or not the implant fixture is vertical, horizontal, or tilted but rather by the human body’s ability to develop a functional stable interface between the biomeaterial of the implant and the patient’s bone. Once osseointegration is achieved, then appropriate biomechanical factors need to be considered for the recommended prosthesis to replace teeth and orofacial structures to maintain osseointegration. From the observations of the scientific literature, clinical practice of the investigated protocol by multiple dentists throughout the world, and this clinician’s individual patients over many procedures, it can be concluded that 4 osseointegrated implants configured in the mandibular or maxillary arches are capable of supporting a fixed prosthesis to allow for an improved quality of life for an edentulous patient.

REFERENCES


